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THE VALUE OF AN OBSERVATION HIVE OF HONEYBEES IN THE TEACHING OF HIGH SCHOOL BIOLOGY.

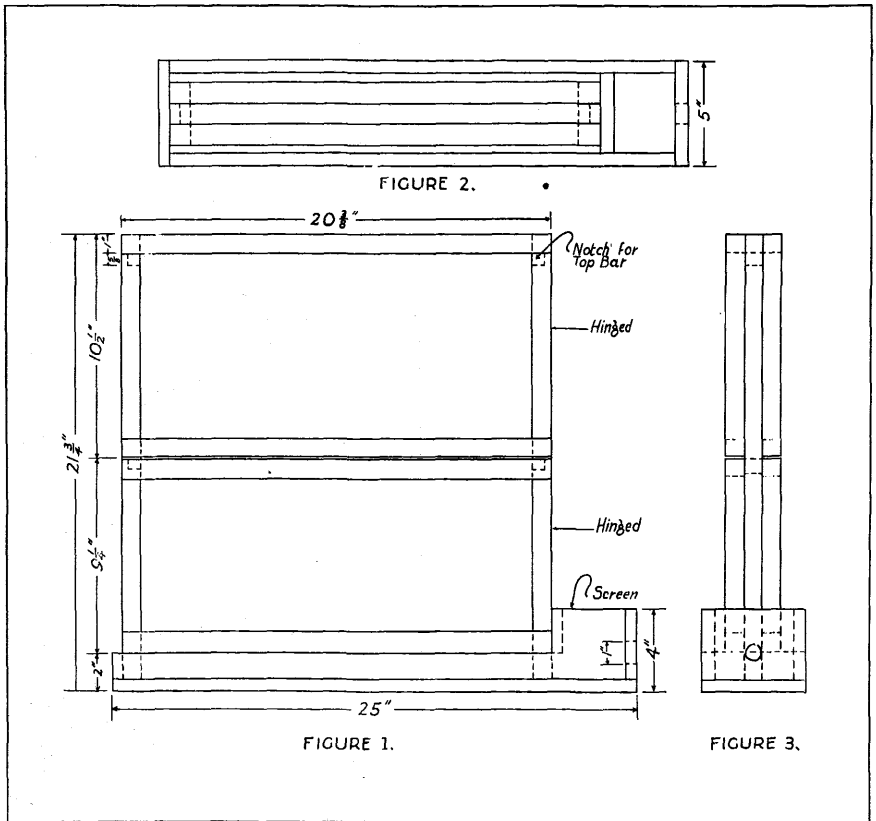
ALMA A. KEELER,
Columbus, Ohio.

Observation hives had their origin in antiquity when small pieces of transparent substances such as horn, isinglass, and mica were placed in the sides of the hives. Such windows offered only a very meager opportunity for studying the behavior of the bees. A hive with a glass window was invented by Mr. W. Mew of Easlington, Gloucestershire, England, about 1650. In 1730, Reaumur, the French naturalist placed a swarm between two panes of glass. The panes were too far apart and the bees built a row of comb on each pane, thus becoming hidden in the center. Bonnet, the Swiss naturalist recommended a hive with doors and having a space that only one row of comb could be built. About 1790, Huber adopted this plan, with the result that great advancement was made in the knowledge of bee life.

Commercial beekeepers have used observation hives extensively for advertising purposes. A frame of brood and honey together with sections are placed in the observation hive. This is kept in the display window for a week or until most of the people in the vicinity have seen it.

In the school laboratory, it is one of the most convenient ways of showing the complete metamorphosis of an insect. Cells may be seen that contain eggs. If these are watched, the development of a larva can be traced to the time that the cell is sealed indicating that pupation is taking place. After pupation, the adult will cut its way out of the cell. The fact that the life history is short makes it possible to trace through the life of an individual insect in a comparatively short time. There is the added value that all stages may be present at the same time. There are few other insects so well adapted to live in the confinement of the schoolroom and at the same time to carry on its normal work.

Social organization among the insects is at its peak among the bees. They are pointed out as the best illustration of



OBSERVATION BEE HIVE.

Designed by Dr. W. E. Dunham.

Drawn by K. D. Powers.

BILL OF MATERIAL.

2 pieces $\frac{1}{2}$ " by $3\frac{1}{2}$ " by 24"
 1 piece $\frac{1}{2}$ " by 5" by 25"
 8 pieces 1" by 1" by $20\frac{3}{8}$ "
 4 pieces 1" by 1" by $10\frac{1}{2}$ "
 4 pieces 1" by 1" by $9\frac{1}{4}$ "
 2 pieces 1" by 1" by $21\frac{3}{4}$ "
 1 piece $1\frac{1}{2}$ " by $\frac{1}{2}$ " by 5"
 1 piece 2" by $\frac{1}{2}$ " by 5"

1 piece $3\frac{1}{2}$ " by $\frac{1}{2}$ " by $3\frac{1}{2}$ "
 2 pieces of window glass $18\frac{7}{8}$ " by 9"
 2 pieces of window glass $7\frac{3}{4}$ " by 9"
 4 small hinges
 2 small hooks
 1 piece of screening 5" by 25"
 2 standard Hoffman frames

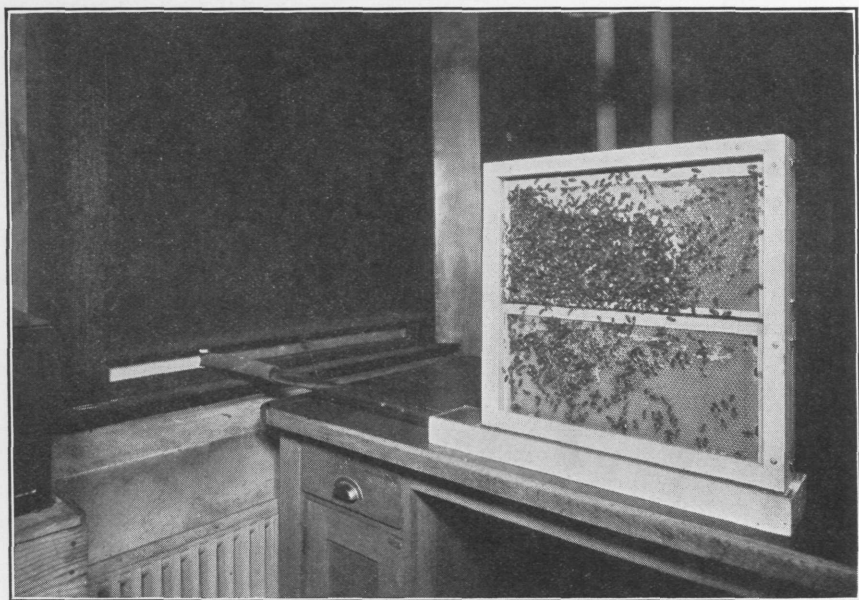
Inside measurement of glass must be exactly $\frac{3}{8}$ " from edge of the top bar of the Hoffman frame.

Both sides may be hinged, but only one side is recommended.

Use an end lap joint on upper frames. All other joints are butt joints held by screws.

communistic life that has yet been evolved. The sacrifice of the individual for the group is seen as each insect uses itself to the utmost to promote the life of the colony. Its labors are never ended as long as there is food that it can gather.

Division of labor begins with the emergence of the adult bee from the cell. The newly emerged worker bees remain in the hive for about two weeks and can be seen doing a variety of kinds of work such as feeding the larvae, making wax,



building comb, cleaning, ventilating, and guarding the hive. As they become older, they fly out on short flights. Soon they will be making longer trips and can be seen coming in with either abdomen distended and full of nectar or the legs covered with pollen. Perhaps they will have both. They store their load in the cells and are ready for another trip in a remarkably short time. They are then called field bees and they continue this work for weeks or until they become worn and exhausted and can no longer get back with the last load.

The queen bee will be observed going about inspecting the cells and laying eggs in the empty ones. When she stops to rest, the nurse bees immediately gather about and feed her.

In winter, when egg laying has ceased, she feeds herself. Queens live several years.

A few drones may be seen but they either die naturally or are killed by the workers before winter comes.

The study of the bee incidentally makes one better acquainted with an occupation through which thousands earn their entire livelihood. There are over a million people who keep bees either for pleasure or profit. The annual value of honey in the United States is forty million dollars and the estimated value of bees as pollinating agents is eight hundred million dollars. The value of the wax produced is about six million dollars.

It is also beneficial for the student to see the cleanliness of the bee and consequently to understand the wholesomeness of a product that is supplied from nature's own laboratory, the nectaries of the flowers. It might be noted that honey is one of the most healthful of foods because of the ease of digestibility, being more readily digested than sugar and that it contains a useful mixture of minerals, possibly one of the vitamins, and at least four enzymes.

Plans for the making of an observation hive are shown in Figures 1, 2, and 3. The amount and kind of material are given. The building of the hive could doubtless be done in cooperation with the manual arts department.

The hive can be stocked in the fall or early spring depending on its intended use. If it is stocked in the fall, and the bees are to be carried over the winter, the observation hive as shown in Figure 1 should have a frame of honey placed above and a frame of emerging brood with a queen below. The honey should carry them over the winter but if it runs low they can be fed with a syrup made of one part of sugar and one part of water.

If the hive is installed in the spring, there must be sufficient food to last until the bees can accumulate enough for themselves. The lower frame may be drawn comb or comb foundation. The latter would be more interesting as the bees would have to build it out before egg laying could begin.

Bees may be obtained from a commercial bee supply house or a beekeeper in the vicinity might be glad to stock the hive. The kind of bees is not important. However the Italian bees are usually preferred as they do not bring in so much unnecessary propolis.

The hive can be located at almost any convenient place in the laboratory and a rubber tube used to connect it to the outside of the building or outside of a window. The bees will readily use this entrance. If the hive can be near a window, it may be placed on a level with the window sill so that the entrance will pass under the window sash. The space on each side is closed with boards.

The hive, if properly stocked, requires little attention other than to see that there are sufficient stores and that the temperature does not fall to freezing without the hive being covered. If the honey supply is low, sugar syrup must be given.

A certain amount of dwindling may be expected but on the whole, the bees will set up housekeeping, go to the fields when the weather permits, and carry on their ordinary work as though there were no prying eyes to see and with small loss in numbers.

The Study of Life.

This English biology written for students preparing for the School Certificate Examination is a very attractive book. In size and make-up it compares very favorably with our recent High School texts. It is built largely of a series of topics which center around the study of type forms. However, many of the newer physiological ideas are included. It is a pleasure to find a biology of this kind in which respiration and energy release are correctly treated. Throughout the book the basic ideas of cause and effect are clouded by the usual teleological statements which involve purpose and need. Thus on p. 67 one reads, "Secondly, water is the basis of all protoplasm, so the plant needs it for that reason." The numerous illustrations are excellent and are appropriate in the places where they are used.—W. M. BARROWS.

Biology: An Introduction to the Study of Life, by H. Munro Fox. 332 pp., 151 figures. Cambridge, The University Press, (in U. S. A. The Macmillan Co.). 1932.